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Model Name: P420HVN03.0

Issue Date: 2011/12/27

(*) Preliminary Specifications
( ) Final Specifications

Customer Signature	Date	AUO	Date
Approved By _____		Approval By PM Director Michael Goan _____	
Note		Reviewed By RD Director Eugene CC Chen _____ Reviewed By Project Leader Alex Chen _____	
		Prepared By PM Antonio Kuo _____	

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Record of Revision

Version	Date	Page	Description
0.0	2011/12/27		First release

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1. General Description

This specification applies to the 42.0 inch Color TFT-LCD Module P420HVN03.0. This LCD module has a TFT active matrix type liquid crystal panel 1,920x1,080 pixels, and diagonal size of 42.0 inch. This module supports 1,920x1,080 mode. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot.

The P420HVN03.0 has been designed to apply the 8/10-bit selectable 2 channel LVDS interface method. It is intended to support displays where narrow bezel width, long life, wide viewing angle, high color saturation, and high color depth are very important.

*** General Information**

Items	Specification	Unit	Note
Active Screen Size	42.02	inch	
Display Area	930.24(H) x 523.26(V)	mm	
Outline Dimension	958.2(H) x 551.1(V) x 27(D)	mm	[1]
Driver Element	a-Si TFT active matrix		
Bezel Opening	938.6 (H) x 531.5 (V)	mm	
Display Colors	1073M	Colors	
Number of Pixels	1,920x1,080	Pixel	
Pixel Pitch	0.4845 (H) x 0.4845 (W)	mm	
Pixel Arrangement	RGB vertical stripe		
Display Operation Mode	Normally Black		
Surface Treatment	Anti-Glare, 3H		Haze=11%
Display Orientation	Portrait/Landscape Enable		[2]

Note:

[1] 27mm is from front panel to driver board cover and 9.9 mm is from front panel to chassis

[2]: During landscape orientation, the control board should be located on the lower side.

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Absolute Maximum Ratings

The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit

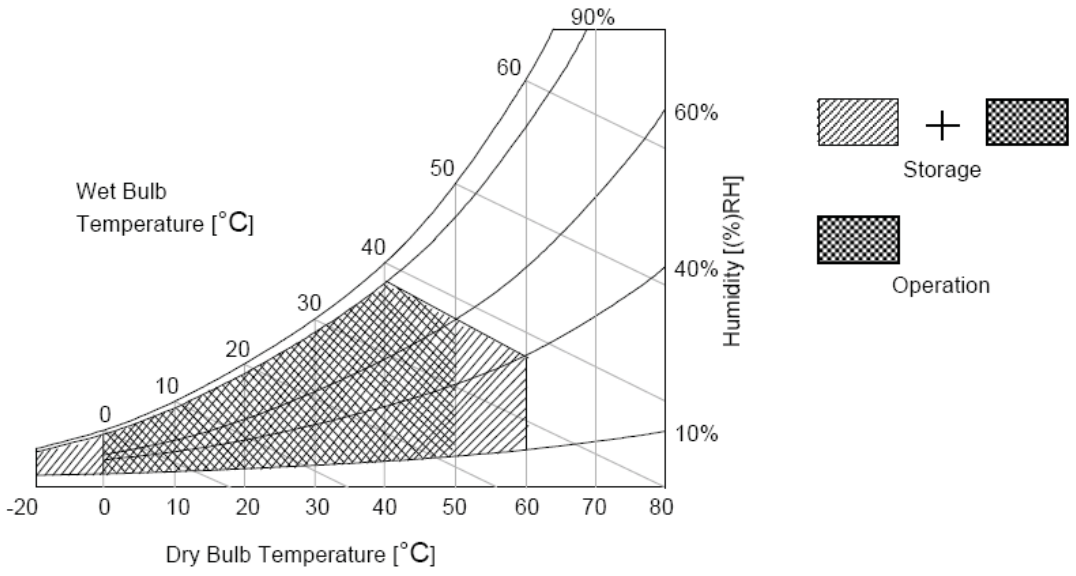
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vcc	-0.3	14	[Volt]	Note 1
Input Voltage of Signal	Vin	-0.3	4	[Volt]	Note 1
BLU Input Voltage	VDDB	-0.3	28	V_{DC}	Note 1
BLU on/off Control Voltage	V_{BLON}	-0.3	7	V_{DC}	Note 1
BLU Brightness Control Voltage	Vdim	-0.3	7	V_{DC}	Note 1
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	HOP	10	90	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[°C]	Note 2
Storage Humidity	HST	10	90	[%RH]	Note 2
Panel Surface Temperature	PST		65	[°C]	Note 3

Note 1: Duration:50 msec.

Note 2 : Maximum Wet-Bulb should be 39℃ and No condensation.

The relative humidity must not exceed 90% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃.

Note 3: Surface temperature is measured at 50℃ Dry condition



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3. Electrical Specification

The P420HVN03.0 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The other is to power Backlight Unit.

3.1 Electrical Characteristics

3.1.1: DC Characteristics

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
LCD							
Power Supply Input Voltage		V_{DD}	10.8	12	13.2	V_{DC}	
Power Supply Input Current		I_{DD}	--	1.2	1.5	A	1
Inrush Current		I_{RUSH}	--	--	4	A	2
Permissible Ripple of Power Supply Input Voltage		V_{RP}	--	--	V_{DD} * 5%	mV_{pk-pk}	3
LVDS Interface	Input Differential Voltage	$\|V_{ID}\|$	200	400	600	mV_{DC}	4
	Differential Input High Threshold Voltage	V_{TH}	+100	--	+300	mV_{DC}	4
	Differential Input Low Threshold Voltage	V_{TL}	-300	--	-100	mV_{DC}	4
	Input Common Mode Voltage	V_{ICM}	1.1	1.25	1.4	V_{DC}	4
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.7	--	3.3	V_{DC}	5
	Input Low Threshold Voltage	V_{IL} (Low)	0	--	0.6	V_{DC}	5
Backlight Power Consumption(Refer to Section: 3.7)		P_{BL}		82.2	87.4	Watt	

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3.1.2: AC Characteristics

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
LVDS Interface	Input Channel Pair Skew Margin	$t_{SKEW\ (CP)}$	-500	--	+500	ps	6
	Receiver Clock : Spread Spectrum Modulation range	Fclk_ss	Fclk -3%	--	Fclk +3%	MHz	7
	Receiver Clock : Spread Spectrum Modulation frequency	Fss	30	--	200	KHz	7
	Receiver Data Input Margin Fclk = 85 MHz Fclk = 65 MHz	tRMG	 -0.4 -0.5	 -- --	 0.4 0.5	ns	8

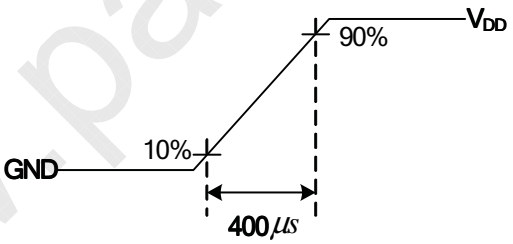
Note :

1. Test Condition:

(1) V_{DD} = 12.0V
(2) Fv = 60Hz
(3) Fclk= Max freq.
(4) Temperature = 25 ℃
(5) Typ. Input current : White Pattern
Max. Input current: Heavy loading pattern defined by AUO

>> refer to “Section:3.3 Signal Timing Specification, Typical timing”

2. Measurement condition : Rising time = 400us



3. Test Condition:

(1) The measure point of V_{RP} is in LCM side after connecting the System Board and LCM.
(2) Under Max. Input current spec. condition.

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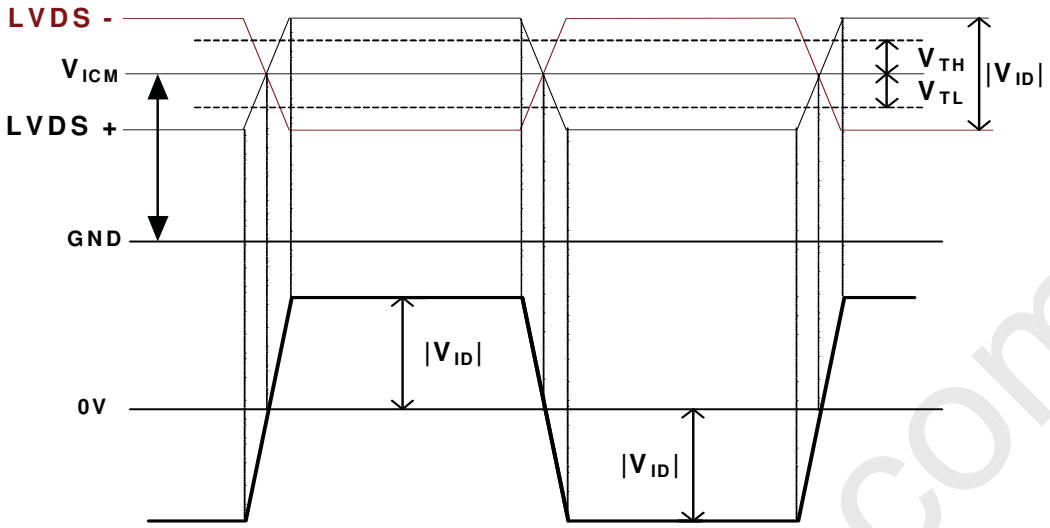
4. V_{ICM} = 1.25V



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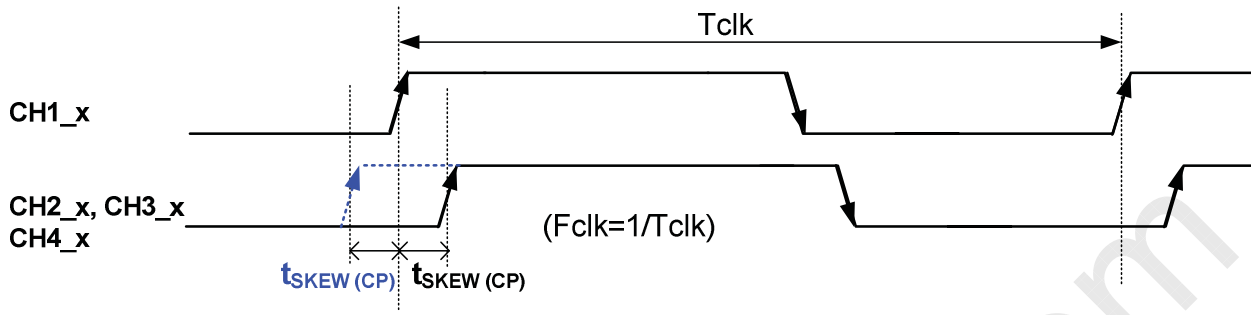
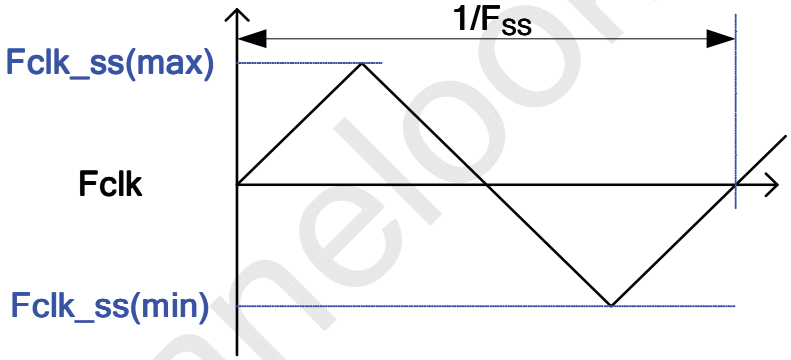
5. The measure points of V_{IH} and V_{IL} are in LCM side after connecting the System Board and LCM.
6. Input Channel Pair Skew Margin.



Note: x = 0, 1, 2, 3, 4

7. LVDS Receiver Clock SSCG (Spread spectrum clock generator) is defined as below figures.



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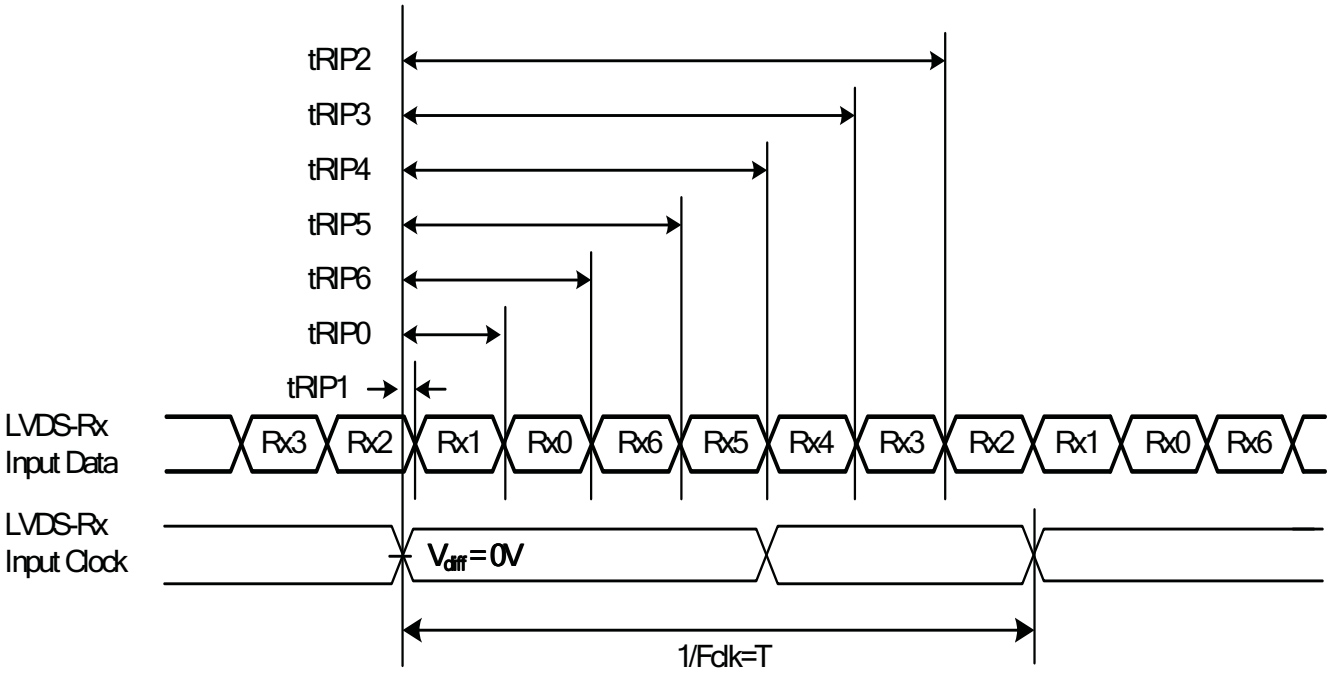
8. Receiver Data Input Margin

Parameter	Symbol	Rating			Unit	Note
		Min	Type	Max		
Input Clock Frequency	Fclk	Fclk (min)	--	Fclk (max)	MHz	**T=1/Fclk**
Input Data Position0	tRIP1	-|tRMG|	0	|tRMG|	ns	
Input Data Position1	tRIP0	T/7-|tRMG|	T/7	T/7+|tRMG|	ns	
Input Data Position2	tRIP6	2T/7-|tRMG|	2T/7	2T/7+|tRMG|	ns	
Input Data Position3	tRIP5	3T/7-|tRMG|	3T/7	3T/7+|tRMG|	ns	
Input Data Position4	tRIP4	4T/7-|tRMG|	4T/7	4T/7+|tRMG|	ns	
Input Data Position5	tRIP3	5T/7-|tRMG|	5T/7	5T/7+|tRMG|	ns	
Input Data Position6	tRIP2	6T/7-|tRMG|	6T/7	6T/7+|tRMG|	ns	



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3.2 Interface Connections

- LCD connector: FI-RE51S-HF (JAE, LVDS connector)

PIN	Symbol	Description	PIN	Symbol	Description
1	N.C.	AUO Internal Use Only	26	N.C.	AUO Internal Use Only
2	N.C.	AUO Internal Use Only	27	N.C.	AUO Internal Use Only
3	N.C.	AUO Internal Use Only	28	CH2_0-	LVDS Channel 2, Signal 0-
4	N.C.	AUO Internal Use Only	29	CH2_0+	LVDS Channel 2, Signal 0+
5	N.C.	AUO Internal Use Only	30	CH2_1-	LVDS Channel 2, Signal 1-
6	ROTATE	Panel Rotation Display Control High(3.3V) : Rotate Enable Open/Low(GND) : Rotate Disable	31	CH2_1+	LVDS Channel 2, Signal 1+
7	LVDS_SEL	Open/High(3.3V) for NS, Low(GND) for JEIDA	32	CH2_2-	LVDS Channel 2, Signal 2-
8	N.C.	No connection	33	CH2_2+	LVDS Channel 2, Signal 2+
9	N.C.	No connection	34	GND	Ground
10	N.C.	No connection	35	CH2_CLK-	LVDS Channel 2, Clock -
11	GND	Ground	36	CH2_CLK+	LVDS Channel 2, Clock +
12	CH1_0-	LVDS Channel 1, Signal 0-	37	GND	Ground
13	CH1_0+	LVDS Channel 1, Signal 0+	38	CH2_3-	LVDS Channel 2, Signal 3-
14	CH1_1-	LVDS Channel 1, Signal 1-	39	CH2_3+	LVDS Channel 2, Signal 3+
15	CH1_1+	LVDS Channel 1, Signal 1+	40	CH2_4-	LVDS Channel 2, Signal 4-
16	CH1_2-	LVDS Channel 1, Signal 2-	41	CH2_4+	LVDS Channel 2, Signal 4+
17	CH1_2+	LVDS Channel 1, Signal 2+	42	N.C.	AUO Internal Use Only
18	GND	Ground	43	N.C.	No connection
19	CH1_CLK-	LVDS Channel 1, Clock -	44	GND	Ground
20	CH1_CLK+	LVDS Channel 1, Clock +	45	GND	Ground
21	GND	Ground	46	GND	Ground
22	CH1_3-	LVDS Channel 1, Signal 3-	47	N.C.	No connection
23	CH1_3+	LVDS Channel 1, Signal 3+	48	V_{DD}	Power Supply, +12V DC Regulated
24	CH1_4-	LVDS Channel 1, Signal 4-	49	V_{DD}	Power Supply, +12V DC Regulated
25	CH1_4+	LVDS Channel 1, Signal 4+	50	V_{DD}	Power Supply, +12V DC Regulated
			51	V_{DD}	Power Supply, +12V DC Regulated

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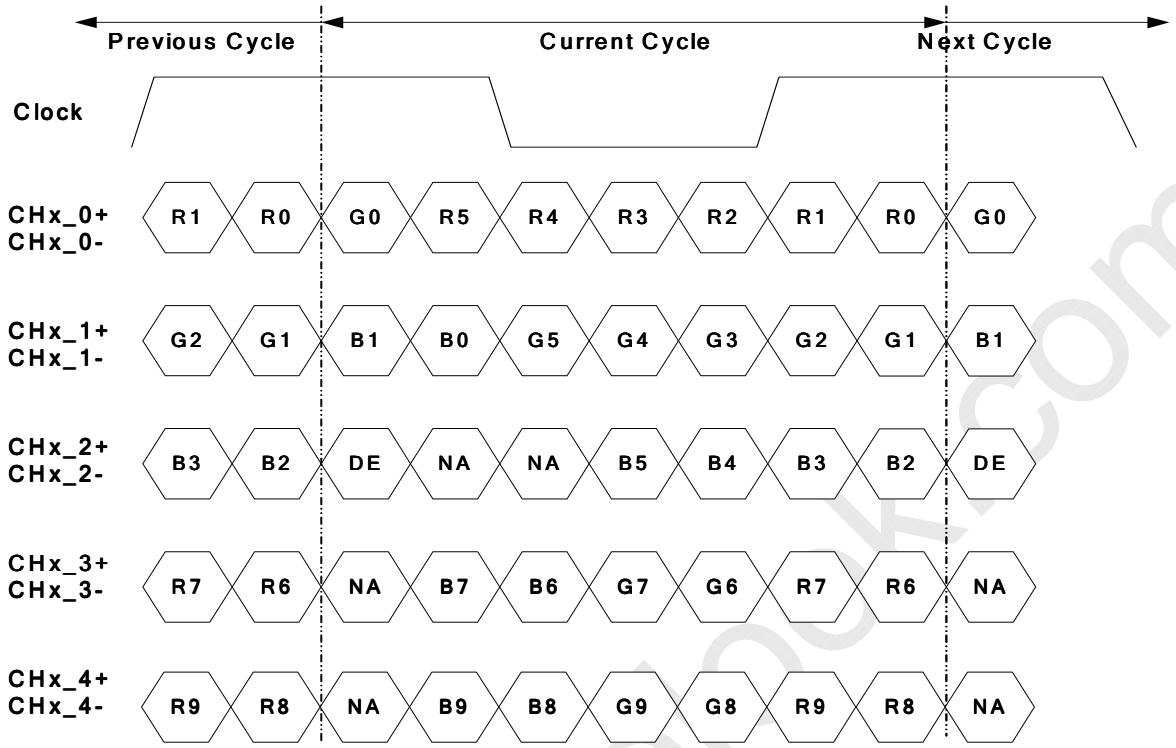
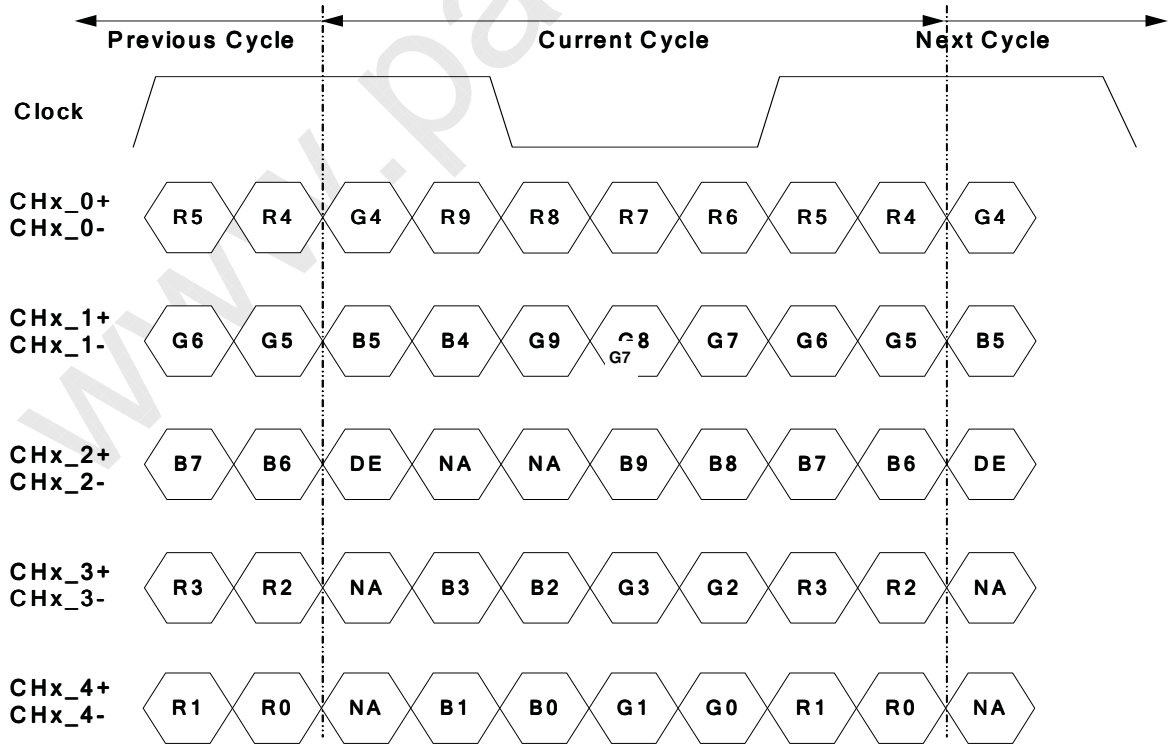
LVDS Option for 10bit

LVDS Option = High/Open➔NS



Note: x = 1, 2, 3, 4...

LVDS Option = Low➔JEIDA



Note: x = 1, 2, 3, 4...

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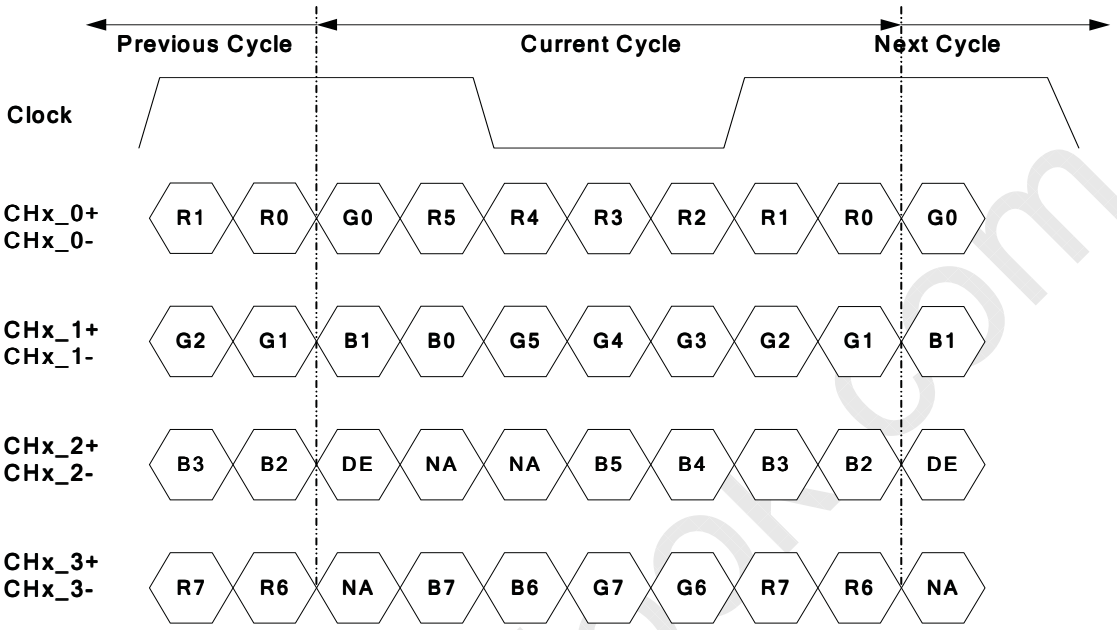
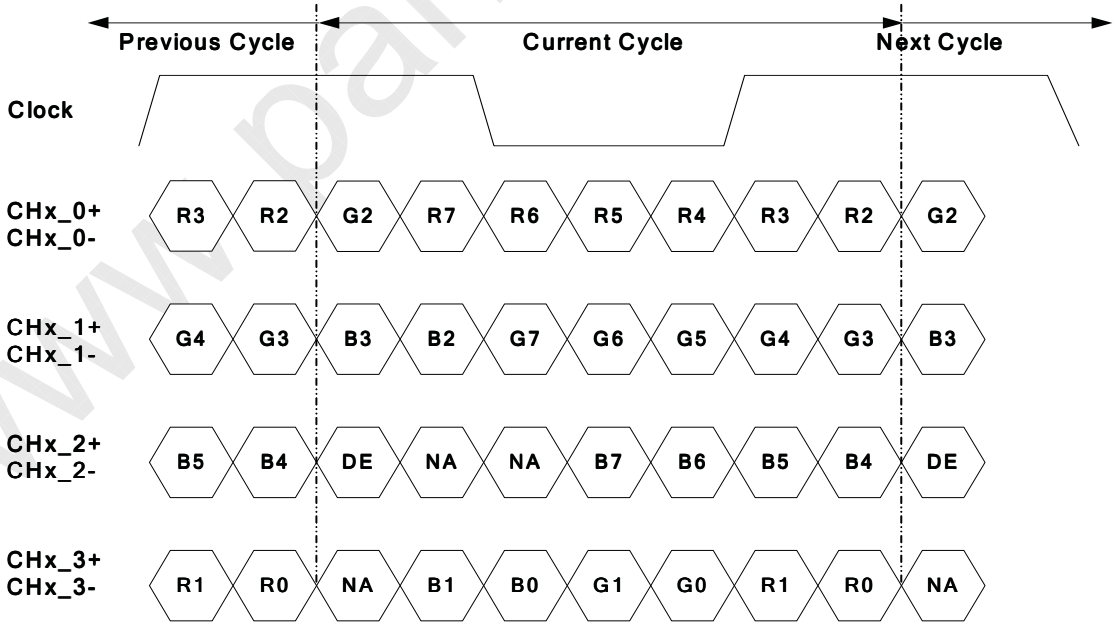
LVDS Option for 8bit

LVDS Option = High/Open➔NS



Note: x = 1, 2, 3, 4…

LVDS Option = Low➔JEIDA



Note: x = 1, 2, 3, 4…

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3.3 Signal Timing Specification

This is the signal timing required at the input of the user connector. All of the interface signal timing should be satisfied with the following specifications for its proper operation.

Timing Table (DE only Mode)

Signal	Item	Symbol	Min.	Typ.	Max	Unit
Vertical Section	Period	Tv	1096	1125	1480	Th
	Active	Tdisp (v)		1080		
	Blanking	Tblk (v)	16	45	400	Th
Horizontal Section	Period	Th	1030	1100	1325	Tclk
	Active	Tdisp (h)		960		
	Blanking	Tblk (h)	70	140	365	Tclk
Clock	Frequency	Fclk=1/Tclk	50	74.25	82	MHz
Vertical Frequency	Frequency	Fv	47	60	63	Hz
Horizontal Frequency	Frequency	Fh	60	67.5	73	KHz

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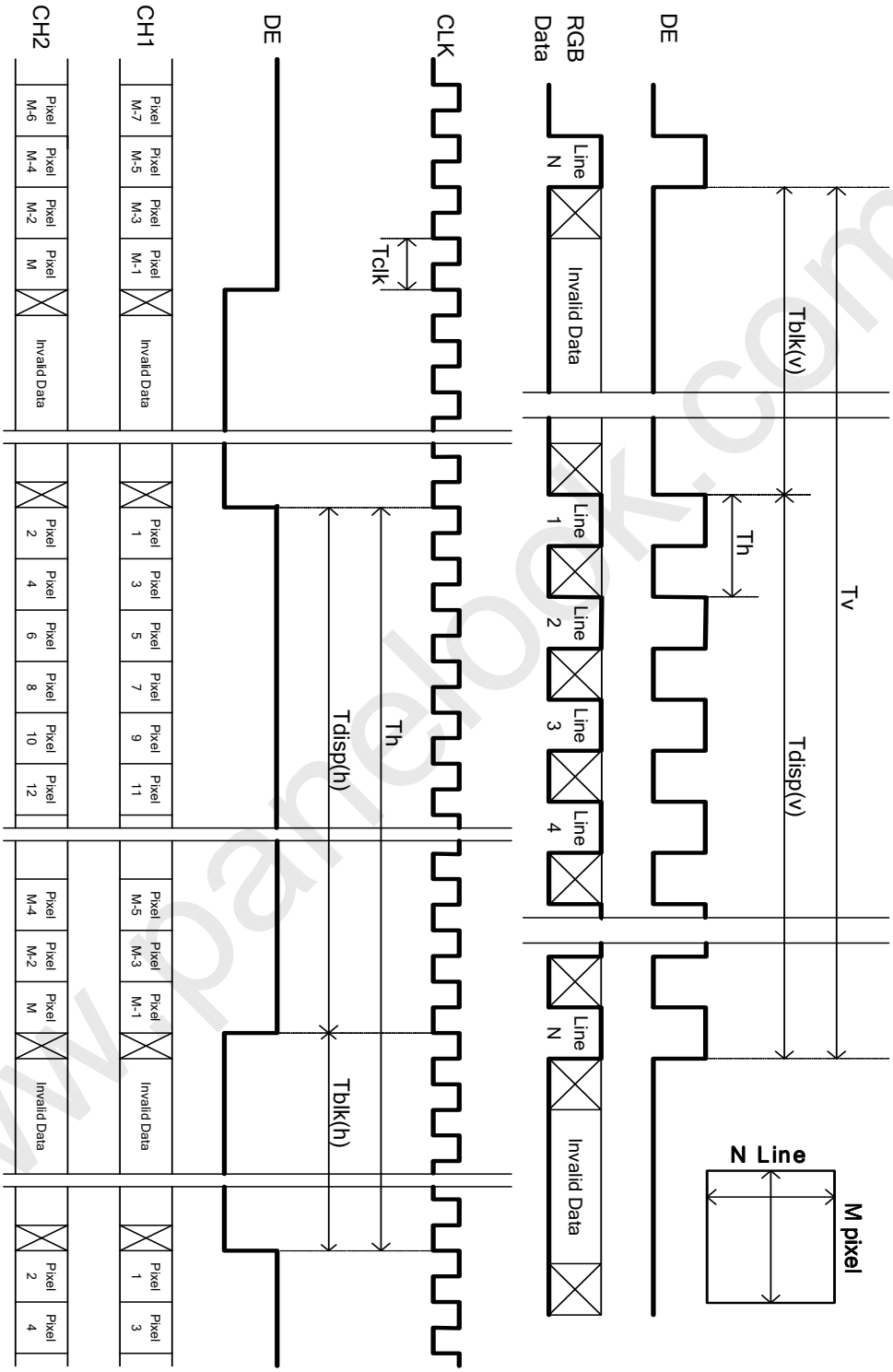
3.4 Signal Timing Waveforms



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3.5 Color Input Data Reference

3.5.1: LVDS Option for 8bit

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

COLOR DATA REFERENCE

Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R	RED(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	GREEN(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
B	BLUE(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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3.5.2: LVDS Option for 10bit

The brightness of each primary color (red, green and blue) is based on the 10 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

COLOR DATA REFERENCE

Color		Input Color Data																													
		RED										GREEN										BLUE									
		MSB									LSB	MSB									LSB	MSB									LSB
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R	RED(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(001)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	RED(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	GREEN(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

	GREEN(1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
B	BLUE(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

	BLUE(1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
	BLUE(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

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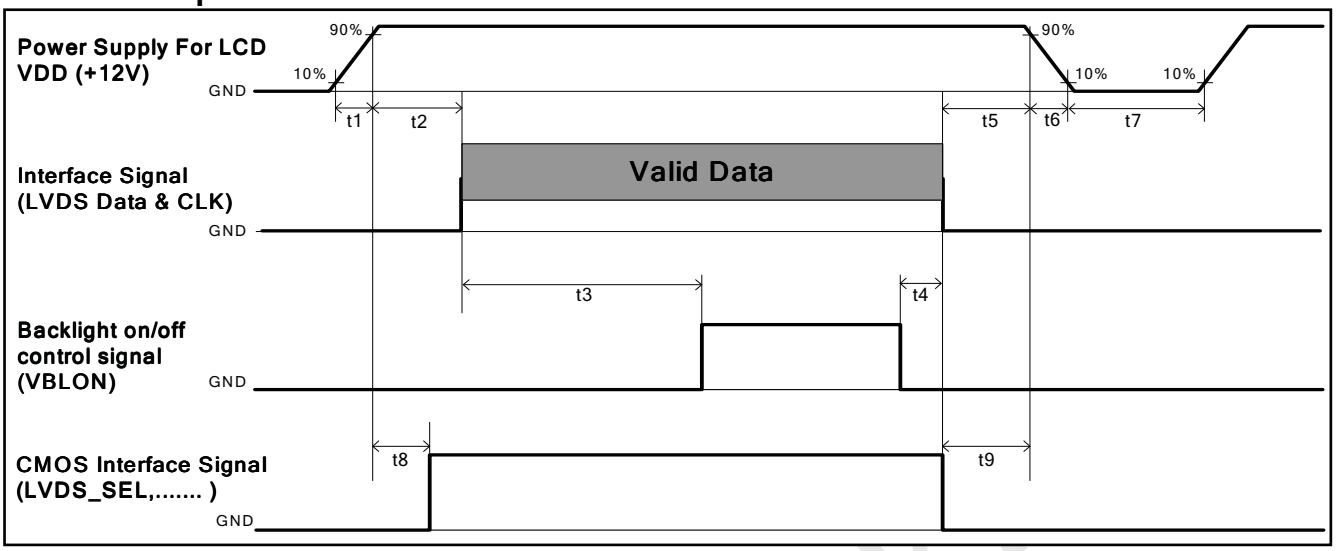
3.6 Power Sequence for LCD

3.6.1: AUO specification



Parameter	Values			Unit
	Min.	Type.	Max.	
t1	0.4	---	30	ms
t2	0.1	---	**50**	ms
t3	**450**	---	---	ms
t4	0 *1	---	---	ms
t5	0	---	---	ms
t6	---	---	--- *2	ms
t7	500	---	---	ms
t8	10 *3	---	50	ms
t9	0	---	---	ms

Note:
(1) t4=0 : concern for residual pattern before BLU turn off.
(2) t6 : voltage of VDD must decay smoothly after power-off. (customer system decide this value)
(3) When CMOS Interface signal is N.C. (no connection), opened in Transmitted end, T8 timing spec can be negligible.

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3.7 Backlight Power Specification for LCD Modules

The backlight unit contains 2pcs of light bar.

3.7.1 Life Time information

Item	Min	Typ	Max	Unit	Note
Operating Life Time	50,000	60,000	-	Hour	1

Note (1) The value is defined as the time at which brightness is 50% of its original value.

Operating condition: Ta =25±2℃

3.7.2. Electrical specification

	Item	Symbol		Condition	Spec			Unit	Note
					Min	Typ	Max		
1	Input Voltage	VDDB		-	22.8	24	25.2	VDC	-
2	Input Current	I_{DDB}		VDDB=24V		**3.43**	**3.64**	ADC	1
3	Input Power	P_{DDB}		VDDB=24V		**82.2**	**87.4**	W	1
4	Inrush Current	I_{RUSH}		VDDB=24V			**7**	ADC	2
5	On/Off control voltage	V_{BLON}	ON	VDDB=24V	2	-	3.3	VDC	-
			OFF		0	-	0.8		3
6	On/Off control current	I_{BLON}		VDDB=24V	-	-	1.5	mA	-
7	Dimming Control Voltage	V_DIM	MAX	VDDB=24V	3.1	-	3.3	VDC	4
			MIN		-	0	-	VDC	-
8	Dimming Control Current	I_DIM		VDDB=24V	-	-	2	mADC	-
9	Internal Dimming Ratio	DIM_R		VDDB=24V	5	-	100	%	5
10	External PWM Control Voltage	V_EPWM	MAX	VDDB=24V	2	-	3.3	VDC	-
			MIN	VDDB=24V	0	-	0.8		-
11	External PWM Control Current	I_EPWM		VDDB=24V	-	-	2	mADC	-
12	External PWM Duty ratio (input duty ratio)	D_EPWM		VDDB=24V	5	-	100	%	5
13	External PWM Frequency	F_EPWM		VDDB=24V	140	180	240	Hz	-
14	DET status signal	DET	HI	VDDB=24V	Open Collector			VDC	6
			Lo		0	-	0.8	VDC	6
15	Input Impedance	Rin		VDDB=24V	300			Kohm	-

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Note 1: Dimming ratio= 100% (MAX)（Ta=25±5℃, Turn on for 45minutes）

Note 2: Measurement condition Rising time = 20ms (VDDB : 10%~90%);

Note 3: When BLU off (VDDB = 24V , VBLON = 0V) , IDDB (max) = 0.02A

Note 4: V_DIM voltage of 100% duty ratio =3.1V~3.3V means Burst Mode entry point should be located between 3.1V and 3.3V.

Note 5: Less than 5% dimming control is functional well and no backlight shutdown happened

Note 6: Normal : 0~0.8V ; Abnormal : Open collector

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3.7.3 Input Pin Assignment

CN3: CI0114M1HRL-NH (Cvilux)

Pin	Symbol	Description
1	VDDB	Operating Voltage Supply, +24V DC regulated
2	VDDB	Operating Voltage Supply, +24V DC regulated
3	VDDB	Operating Voltage Supply, +24V DC regulated
4	VDDB	Operating Voltage Supply, +24V DC regulated
5	VDDB	Operating Voltage Supply, +24V DC regulated
6	BLGND	Ground and Current Return
7	BLGND	Ground and Current Return
8	BLGND	Ground and Current Return
9	BLGND	Ground and Current Return
10	BLGND	Ground and Current Return
11	DET	BLU status detection: Normal : 0~0.8V ; Abnormal : Open collector (Recommend Pull high R > 10K, VDD = 3.3V)
12	VBLON	BLU On-Off control: High/Open (2~3.3V) : BL On ; Low (0~0.8V/GND) : BL Off
13	VDIM	Internal PWM (0~3.3V for 5~100% Duty, open for 100%) < NC ; when External PWM mode>
14	PDIM(*)	External PWM (5%~100% Duty, open for 100%) < NC ; when Internal PWM mode>

PWM Dimming

(Note*) IF External PWM function less than 5% dimming ratio. Judge condition as below:
(1) Backlight module must be lighted ON normally.
(2) All protection function must work normally.
(3) Uniformity and flicker could not be guaranteed

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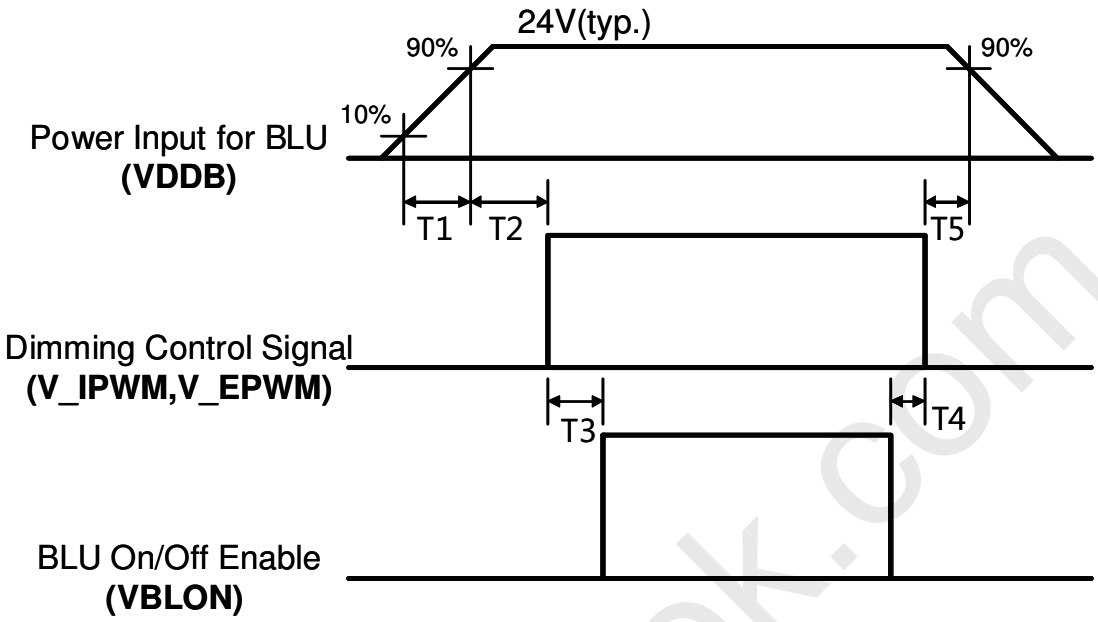
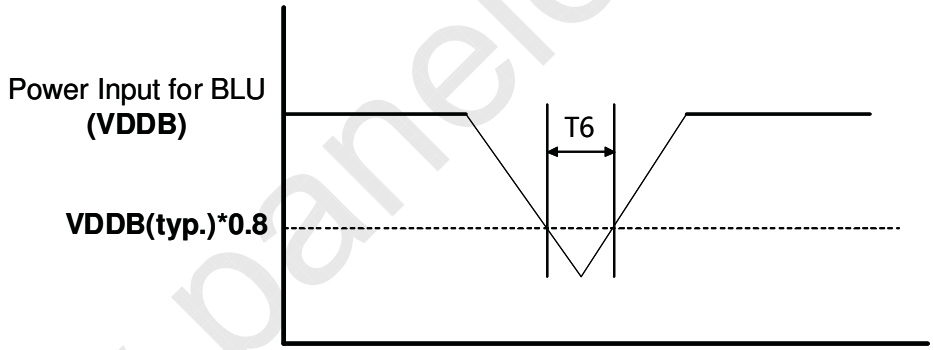
3.7.4 Power Sequence for Backlight



Dip condition for Inverter



Parameter	Value			Units
	Min	Typ	Max	
T1	20	-	-	ms
T2	500	-	-	ms
T3 (Normal)	250	-	-	ms
T4	0	-	-	ms
T5	1	-	-	ms
T6	-	-	10	ms

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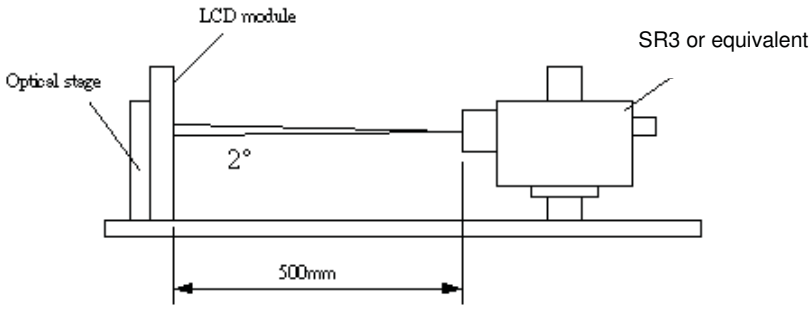
4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 45 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of φ and θ equal to 0°.

Fig.1 presents additional information concerning the measurement equipment and method.



Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max		
Contrast Ratio		CR	3200	4000	--		1
Surface Luminance (White)		L_{WH}	560	700	--	cd/m^2	2
Luminance Variation		$\delta_{WHITE(9P)}$	--	--	1.33		3
Response Time (G to G)		Tγ	--	8	--	Ms	4
Color Gamut		NTSC		72		%	
Color Coordinates							
	Red	R_X	Typ.-0.03	0.630	Typ.+0.03		
		R_Y		0.330			
	Green	G_X		0.320			
		G_Y		0.620			
	Blue	B_X		0.150			
		B_Y		0.040			
	White	W_X		0.280			
		W_Y		0.290			
Viewing Angle							5
	x axis, right(φ=0°)	θ_r	--	89	--	degree	
	x axis, left(φ=180°)	θ_l	--	89	--	degree	
	y axis, up(φ=90°)	θ_u	--	89	--	degree	
	y axis, down (φ=270°)	θ_d	--	89	--	degree	

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Note:

1. Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance of } L_{on5}}{\text{Surface Luminance of } L_{off5}}$$

2. Surface luminance is luminance value at point 5 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see FIG 2. LWH=Lon5 where Lon5 is the luminance with all pixels displaying white at center 5 location.
3. The variation in surface luminance, δWHITE is defined (center of Screen) as:

   $\delta_{WHITE(9P)}$= Maximum(L_{on1}, L_{on2},…,L_{on9})/ Minimum(L_{on1}, L_{on2},…L_{on9})
4. Response time T_γ is the average time required for display transition by switching the input signal for five luminance ratio (0%,25%,50%,75%,100% brightness matrix) and is based on F_v=60Hz to optimize.

Measured Response Time		Target				
		0%	25%	50%	75%	100%
Start	0%		0% to 25%	0% to 50%	0% to 75%	0% to 100%
	25%	25% to 0%		25% to 50%	25% to 75%	25% to 100%
	50%	50% to 0%	50% to 25%		50% to 75%	50% to 100%
	75%	75% to 0%	75% to 25%	75% to 50%		75% to 100%
	100%	100% to 0%	100% to 25%	100% to 50%	100% to 75%	

T_γ is determined by 10% to 90% brightness difference of rising or falling period. (As illustrated)
The response time is defined as the following figure and shall be measured by switching the input signal for "any level of grey(bright) " and "any level of gray(dark)".

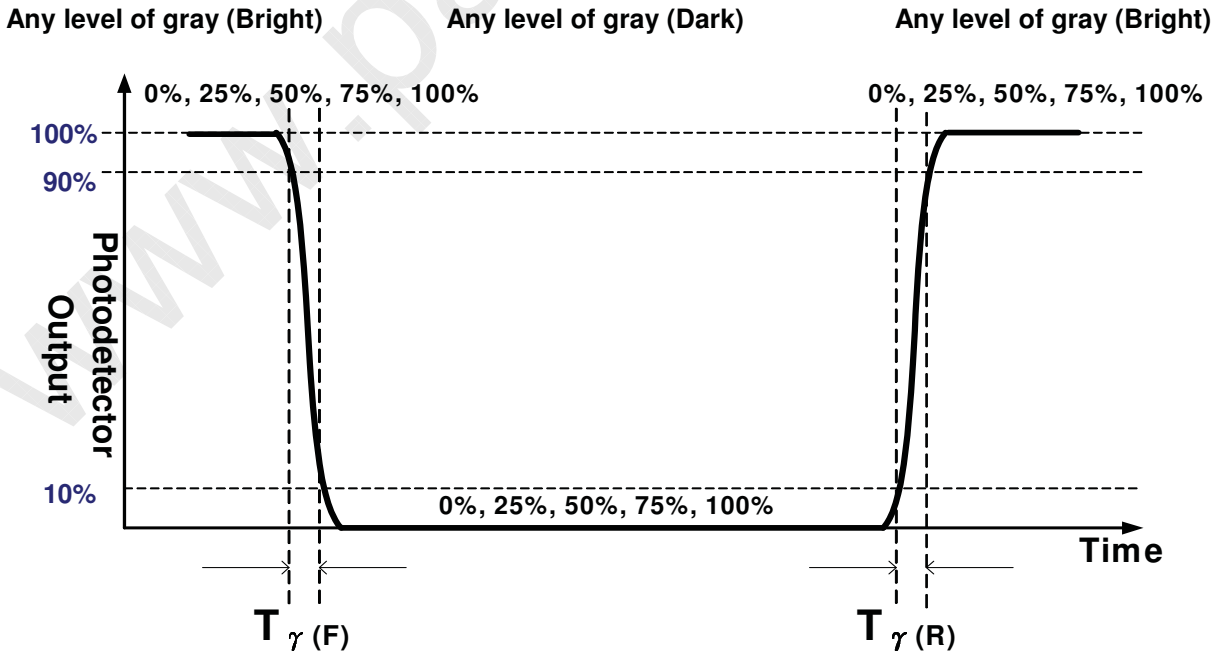

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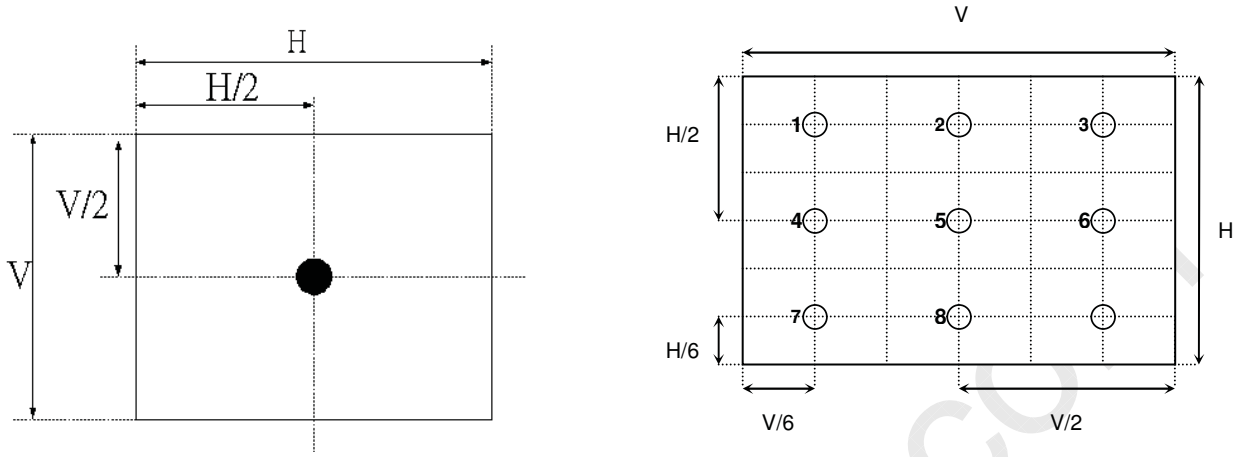
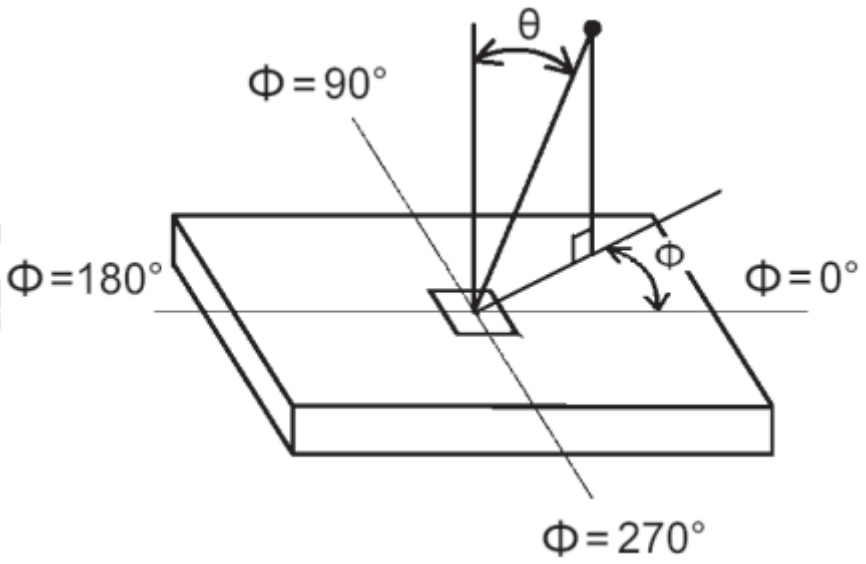
FIG. 2 Luminance



5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG3.

FIG.3 Viewing Angle



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5. Mechanical Characteristics

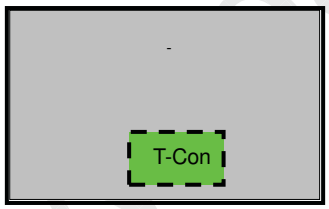
The contents provide general mechanical characteristics for the model P420HVN03.0. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Item		Dimension	Unit	Note
Outline Dimension	Horizontal	958.2	mm	
	Vertical	551.10	mm	
	Depth (Dmin)	9.9	mm	to rear
	Depth (Dmax)	26.65	mm	to wall mount
Weight	9.5		g	

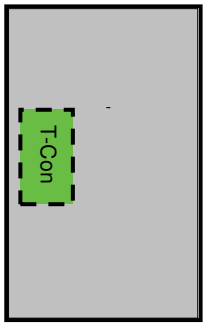
5.1 Placement Suggestions

1. Landscape Mode: The default placement is T-Con Side on the bottom side.
2. Portrait Mode: The default placement is that T-Con side has to be placed on the left side via viewing from the front.

Landscape (**Front view**)



Portrait (**Front view**)



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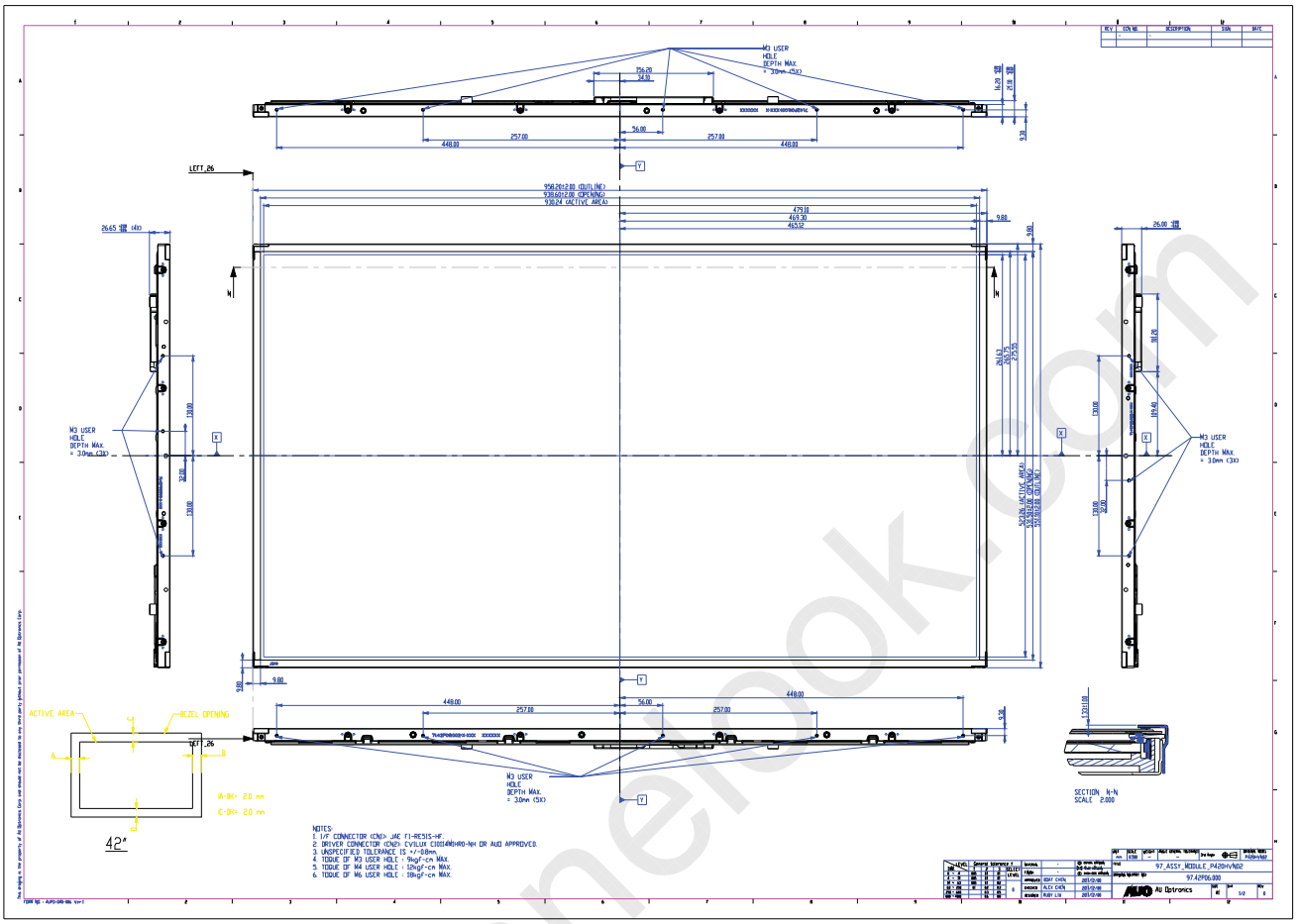
Front View



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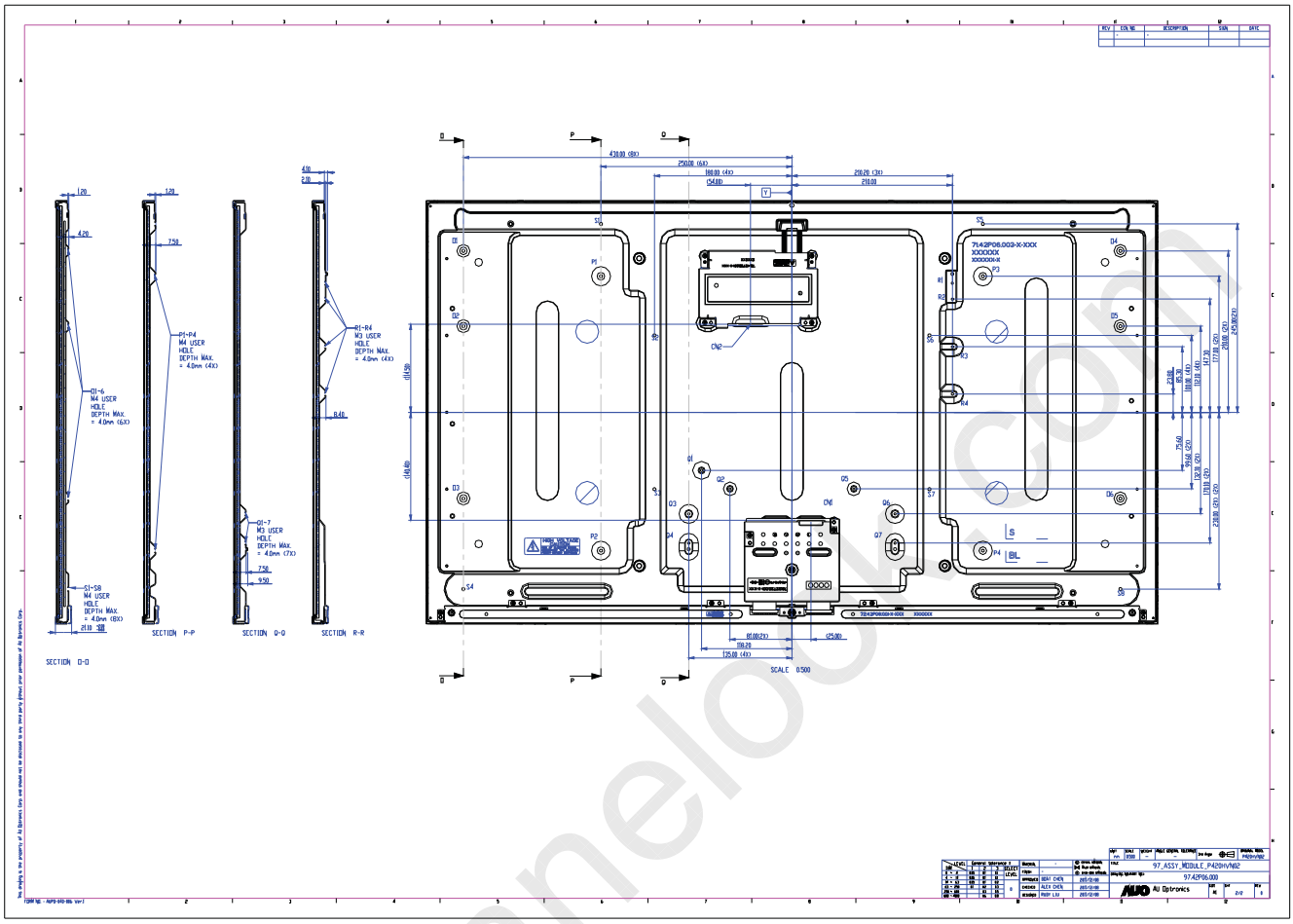
Back View



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6. Reliability Test Items

	Test Item	Q'ty	Condition
1	High temperature storage test	3	60℃, 500hrs
2	Low temperature storage test	3	-20℃, 500hrs
3	High temperature operation test	3	50℃, 500hrs
4	Low temperature operation test	3	-5℃, 500hrs
5	Vibration test (non-operation)	3	Wave form: random Vibration level: 1.0G RMS Bandwidth: 10-300Hz, Duration: X, Y, Z 10min One time each direction
6	Shock test (non-operation)	3	Shock level: 50G Waveform: half since wave, 11ms Direction: ±X, ±Y, ±Z, One time each direction
7	Vibration test (With carton)	1(PKG)	Random wave (1.05G RMS, 10-200Hz) 10mins/ Per each X,Y,Z axes
8	Drop test (With carton)	1(PKG)	Height: 25.4cm (ASTMD4169-I) Front->Rear->Left->Right->Bottom->Bottom (refer ASTM D 5276)

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7. International Standard

7.1 Safety

(1) UL 60950-1; Standard for Safety of Information Technology Equipment Including electrical Business Equipment.

(2) IEC 60950-1 : 2001; Standard for Safety of International Electrotechnical Commission

(3) EN 60950 : 2001+A11; European Committee for Electrotechnical Standardization (CENELEC), EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7.2 EMC

(1) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz. “American National standards Institute(ANSI), 1992

(2) C.I.S.P.R “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” International Special committee on Radio Interference.

(3) EN 55022 “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” European Committee for Electrotechnical Standardization. (CENELEC), 1998

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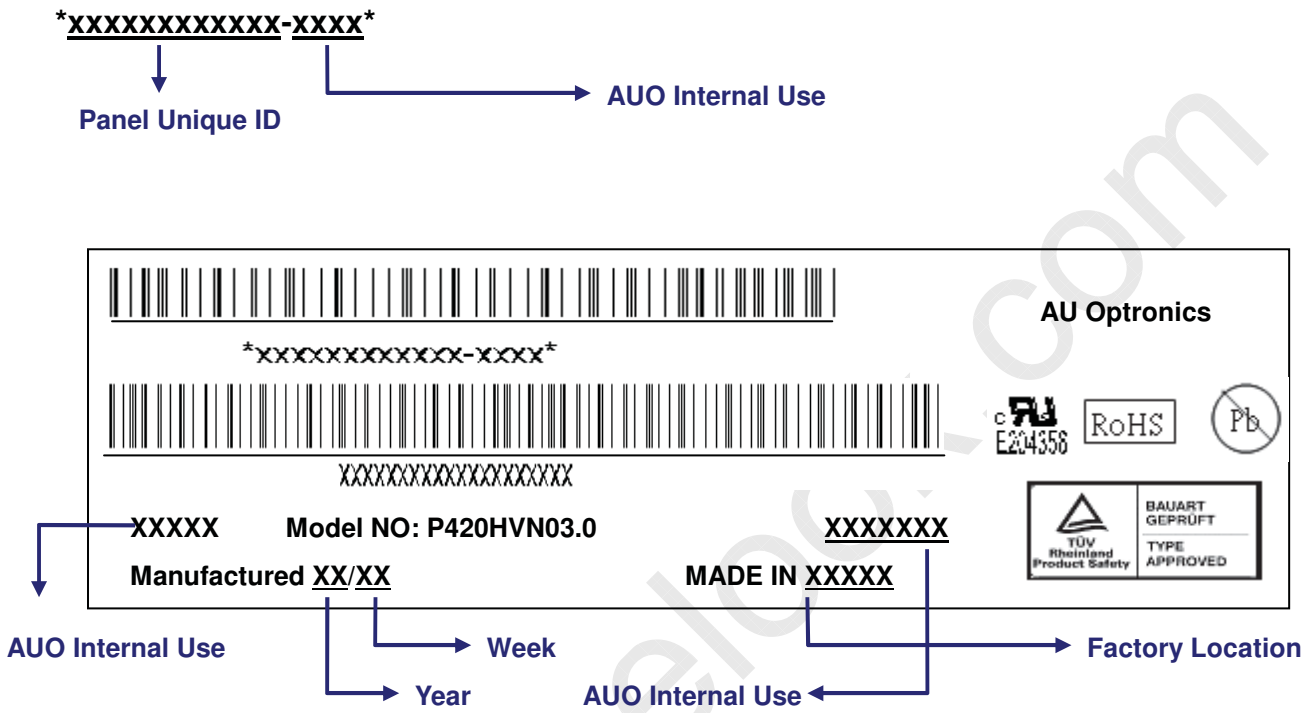
8. Packing

8-1 DEFINITION OF LABEL:

A. Panel Label:



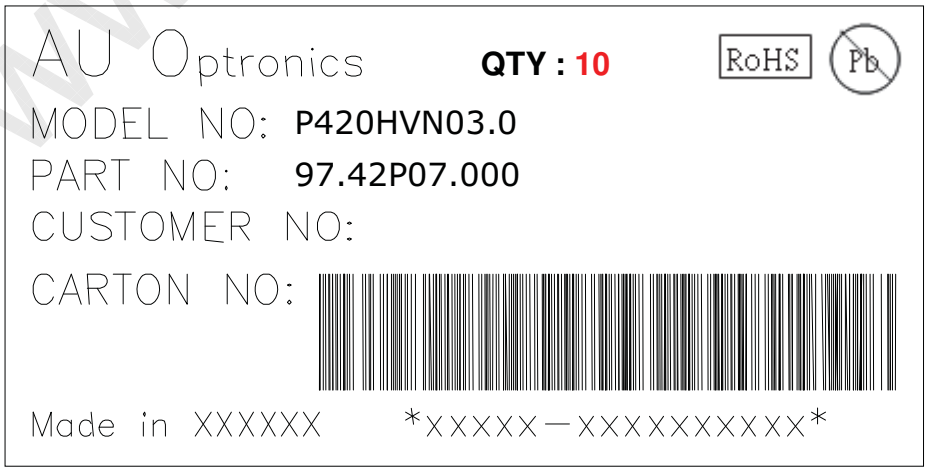
Green mark description

(1) For Pb Free Product, AUO will add Pb for identification.

(2) For RoHs compatible products, AUO will add RoHS for identification.

Note: The green Mark will be present only when the green documents have been ready by AUO internal green team. (definition of green design follows the AUO green design checklist.)

B. Carton Label:



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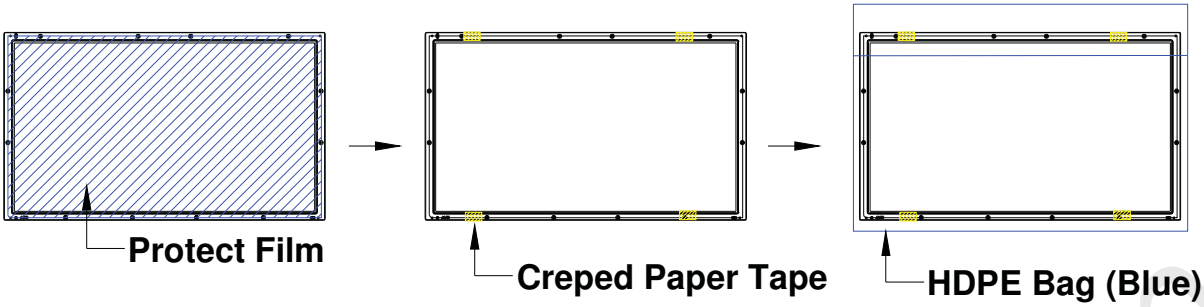
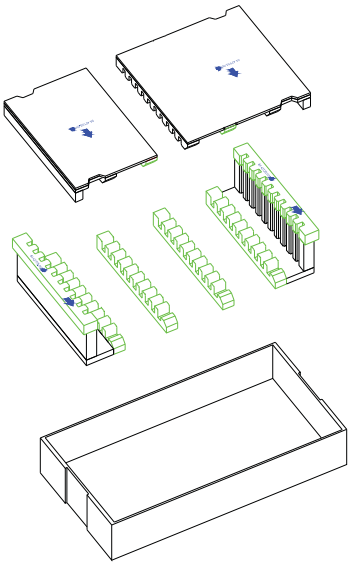
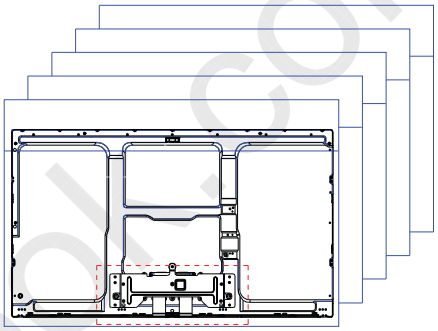
8-2 PACKING METHODS:



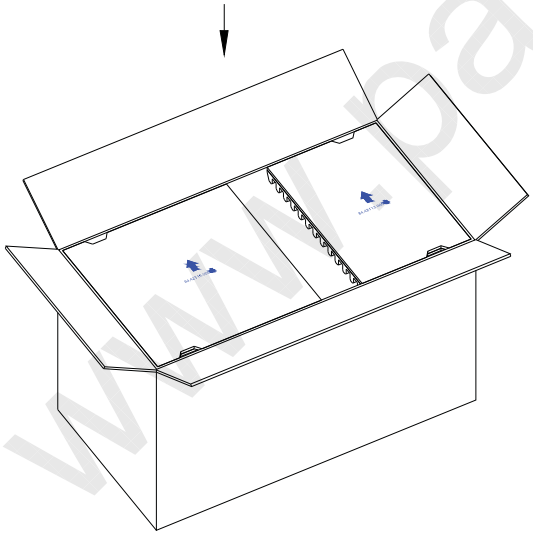


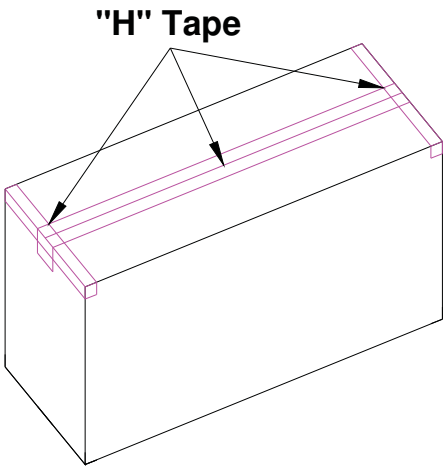
Cushion Set



Packing Way：Panel Top Side Down

(10) Pcs Modules





(10) Pcs / 1 Carton

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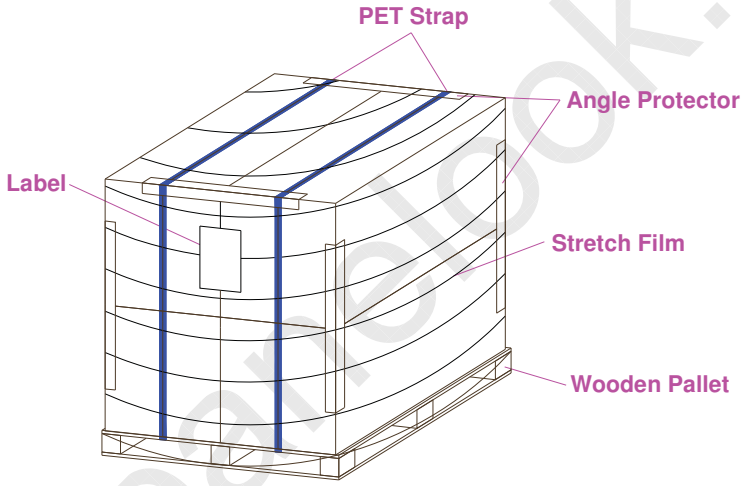
8-3 Pallet and Shipment Information

	Item	Specification			Packing Remark
		Qty.	Dimension	Weight (kg)	
1	Packing BOX	10pcs/box	1050(L)*560(W)*640(H)	95	
2	Pallet	1	1150(L)*1070(W)*132(H)	14.5	
3	Boxes per Pallet	2 boxes/pallet			
4	Panels per Pallet	20pcs/pallet			
	Pallet after packing	20	1150(L)*1070(W)*772(H)	204.5	



單棧 pallet 打棧示意圖

Single pallet packaging illustration

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9. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

9-1 MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged in four corners or four sides.

(2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.

(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(4) You should adopt radiation structure to satisfy the temperature specification.

(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter cause circuit broken by electro-chemical reaction.

(6) Do not touch, push or rub the exposed polarizer with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)

(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizer. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(9) Do not open the case because inside circuits do not have sufficient strength.

9-2 OPERATING PRECAUTIONS

(1) The device listed in the product specification sheets was designed and manufactured for TV application

(2) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V=±200mV(Over and under shoot voltage)

(3) Response time depends on the temperature. (In lower temperature, it becomes longer..)

(4) Brightness of CCFL depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.

(5) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

(6) When fixed patterns are displayed for a long time, remnant image is likely to occur.

(7) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall

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be done by system manufacturers. Grounding and shielding methods may be important to minimize the interface.

9-3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

9-4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9-5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

9-6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape. When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.

(3) You can remove the glue easily. When the glue remains on the bezel or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

9-7 Operating Condition in PID Application

(1) If the continuous static display is required, periodically inserting a motion picture is strongly recommended.

(2) Recommend to periodically change the background color and background image.

(3) Recommend not to continuously operate over 20 hours a day.

(4) Recommend to adopt one of the following actions after long time display.

I. Running the screen saver (motion picture or black pattern)

II. Power off the system for a while

(5) Try not to run the LCD in a closed environment. Suitable venting on the system cover would be helpful for cooling.

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(6) It is better to adapt active cooling with fans for long time displaying, especially for high luminance LCD model.

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